

## RAMARIA SUBGENERA RAMARIA AND LAETICOLORA IN YUNNAN\*

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### 15. 红柄丛枝瑚

*Ramaria sanguinipes* Petersen et Zang. Acta Bot. Yunnan 1986. 8: 289.

Fruitbodies up to  $6 \times 5$  cm, curved-obovate to generally circular in outline. Stipe up to  $3 \times 3$  cm, single or fasciculate, stout, smooth to somewhat marbled, off-white to ivory-colored, not canescent, often with aborted branchlets, rounded at base, tapering sharply downward, watery brunnescent, stained maroon ("Vandyke red," "madder red") at base, and suffused in this color upward; flesh solid, dry, punky, marbled, deep pinkish red downward under stained surface. Major branches several, short when young, lengthening significantly over time, ivory-colored; branches in 3—6 ranks, abruptly shorter than major branches, ivory-colored below, pallid clear yellow ("cream buff", "baryta yellow") upward, eventually fading to pallid ocher; internodes diminishing abruptly above in adolescence, less so at maturity; axils narrowly rounded. Apices slender, small, not terraced at any age, somewhat divaricate in some specimens, dichotomous, pallid clear yellow ("baryta yellow," "antimony yellow"). Taste mildly fabaceous or bitter; odor weakly aromatic.

Macrochemical reactions: SYR = positive on rind only; KOH = orange; FCL = green; GUA, NOH, PHN, ANW, PYR, IKI, CRE = negative.

Stipe tramal hyphae up to  $14 \mu\text{m}$  diam, hyaline, thin-walled to locally somewhat thick-walled (wall up to  $0.5 \mu\text{m}$  thick), virtually unclamped, not parallel, not agglutinated or adherent. Tramal hyphae of upper branches up to  $10 \mu\text{m}$  diam, hyaline, thin-walled, parallel; clamp connections occasional on medullary hyphae, common on cortical hyphae. Subhymenium extensive, hyphal. Hymenium thickening, basidia  $40\text{--}45 \times 8\text{--}10 \mu\text{m}$ , clavate, clamped invariably; contents granular to multiguttulate; sterigmata 4, more or less straight, somewhat divergent.

Spores  $9.4\text{--}11.5 \times 4.3\text{--}5.0 \mu\text{m}$  ( $E = 2.00\text{--}2.58$ ;  $E^m = 2.28$ ;  $L^m = 10.47 \mu\text{m}$ ),

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\* Continued from Vol. 11(4): 363—396, 1989.——Editor

ellipsoid to narrowly ovate, often with suprahilar depression, conspicuously rough in profile, contents 1-several guttulate, the guttules deep ochre to brown, wall up to  $0.3\ \mu\text{m}$  thick, hilar appendix small but conspicuous, ornamentation of cyanophilous, complex, anastomosing ridges and a few isolated warts up to  $0.3\ \mu\text{m}$  high.

Commentary. For some time it was thought that the only rubescent species of subg. *Laeticolora* in Yunnan was *R. sanguinipes*, which was described from a single specimen from central Yunnan. To it can now be added *R. rubriattenuipes* and *Ramaria* taxon I (q. v.). Among them, *R. sanguinipes* is perhaps the least commonly seen. The specimen cited below was purchased in the Lijiang market, attesting to its edibility.

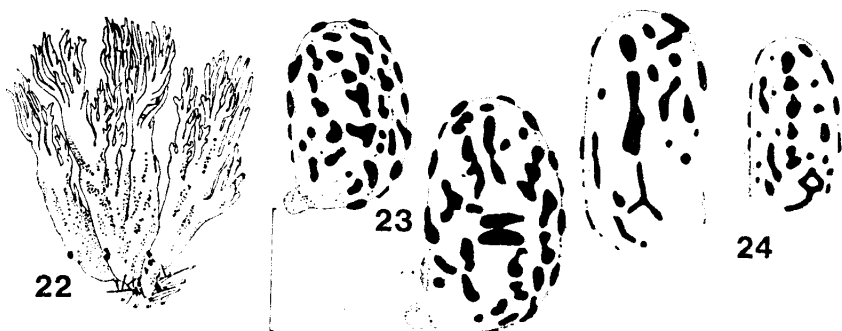
Specimens examined: Yunnan, Lijiang Pref., Lijiang market, 6. ix. 1987, no. 21308 (TENN, HKAS: 20080); Szemao, 20. ix. 83, no. 45677 (Holotype, TENN, isotype, HKAS: 10418).

#### 16. 华联丛枝瑚

*Ramaria sino-conjunctipes* Petersen et Zang, sp. nov.

Figs. 22, 23

Basidiocarpi multiramiosi, ad  $9.5 \times 5\ \text{cm}$ , fasciculati, tenui-pyriforme. Basi ad  $4 \times 0.5\ \text{cm}$ , tenui, fasciculati, cum basidiocarpi abortivi, contusi non-brunnescenti, caro albo, non-gelatinoso. Rami et ramuli deorsum pallide salmonicolor, incarnato-ochracei superne. Apices tenui, flavi ad flavo-ochracei. Hyphae contextualis afibulatae, crassitunicatae. Basidia  $52-57\ \mu\text{m}$  longa, clavata, afibulata, cyanophila. Sporae  $7.2-8.3 \times 4.7-5.4\ \mu\text{m}$ , crassi-cylindricae, subcorrugatae.



Figs. 22-24. *Ramaria* fruitbody and spores. 22, 23, *R. sino-conjunctipes*. 22. Fruitbody. 23. Spores, TENN 47276. 24. Yunnan *Ramaria* taxon 1, spores, TENN 47308. Standard bar =  $5\ \mu\text{m}$  for spores.

Fruitbodies (Fig. 22) up to  $9.5 \times 5\ \text{cm}$ , in fascicles of 15-20 individuals, the aggregate fusiform to narrowly obpyriform in outline. Stipes fasciculate to cespitose, rarely very small and branched almost from the base, attenuate, rooting, longitudinally gnarled or rugose, often with abortive individuals, off-white below, upward delicate pink ("seashell pink"), flesh very pale pink, water-soaked but not gelatinous, solid below, hollow or stuffed above, drying cartilaginous. Branches in

2—5 ranks, strictly ascending, terete to flattened, pallid salmon (“salmon buff”) below for varying distances upward, tending toward flesh-ochre or pastel yellow ochre upward (“light ochraceous salmon,” “buff yellow,” “warm buff”), hollow throughout, flesh pinkish-hygrophaneous, drying cartilaginous, internodes long throughout, diminishing gradually at maturity; axils narrowly rounder below, broadly rounded above. Apices long, acerose to occasionally cristate, awlshaped, yellow when young (“empire yellow”), yellow-ochre by maturity (“buff yellow”), remaining so in age. Odor and taste negligible.

Macrochemical reactions: SYR, FCL = positive; IKI = greenish; GUA, ANO = sometimes weakly positive; NOH, KOH, PYR, PHN, ANW, CRE = negative.

Stipe tramal hyphae 3—15  $\mu\text{m}$  diam, hyaline, clampless, interwoven, not agglutinated or adherent, thick-walled (wall up to 1.5  $\mu\text{m}$  thick); ampulliform septa up to 17  $\mu\text{m}$  broad, thick-walled (wall up to 2  $\mu\text{m}$  thick), aliiform, with extensive, delicate stalactitiform ornamentation; gloeoplerous hyphae not observed. Tramal hyphae of upper branches 3—14  $\mu\text{m}$  diam, hyaline, tightly interwoven, clampless, thin-to thick-walled (wall up to 0.5  $\mu\text{m}$  thick). Subhymenium rudimentary; hyphae 1—3  $\mu\text{m}$  diam, hyaline, tightly interwoven, clampless. Hymenium thickening; basidia 52—57  $\times$  9—11  $\mu\text{m}$ , clavate, clampless; contents homogeneous or with scattered, refringent guttules at maturity, moderately to strongly cyanophilous, but without cyanophilous granules; sterigmata (2—) 4, long, stout, straight.

Spores (Fig. 23) 7.2—8.3(—9.4)  $\times$  4.7—5.4  $\mu\text{m}$  ( $E = 1.31$ — $1.79$ ;  $E^m = 1.58$ ;  $L^m = 7.90$   $\mu\text{m}$ ), broadly cylindrical, flattened somewhat adaxially, obscurely roughened in profile, “light ochraceous salmon” in prints; contents 1 (—3)—guttulate, the guttules brightly refringent, yellow; wall up to 0.2  $\mu\text{m}$  thick; hilar appendix hardly discernable to gradual but not prominent, broad; ornamentation of delicate, short, beaded ridges randomly placed.

Commentary: There is a taxonomic complex characterized by fruitbodies with fasciculate, attenuate stipes, clampless hyphae, and short, wide spores. Fruitbodies of most included taxa exhibit pink to salmon branches and yellow apices, but one [*R. lorithamnus* (Berk.) Pet.] has fruitbodies yellow-ochre all over. Of those with salmon/yellow color pattern, only one [*R. ignicolor* (Bres.) Pet.] fruits in Europe.

Fruitbodies of both collections cited below showed salmon lower branches but yellow to yellow-ochre upper branches and apices. Thus it appears intermediate between typical salmon/yellow taxa and *R. lorithamnus*.

Of the two collections cited below, one was made from a location under *Picea*, *Abies*, and *Sinarundinaria*. The other came from the Lijiang market, attesting to the edibility of fruitbodies of the species.

Marr and Stuntz's (1973) concept under *R. conjunctipes* was probably not

contoxic with typical material from eastern North America. Branches were described as hollow and flesh as watery-gelatinous, neither character typical of eastern North American material. While seemingly a trifling distinction, flesh in *R. sino-conjunctipes* is not gelatinous (hyphae not agglutinated or adherent microscopically), but watery-hygrophanous. It is this quality, not gelatinization, which causes the cartilaginous consistency on drying. We have not studied western North American collections carefully, but Petersen doesn't recall seeing gelatinous flesh in those taxa, although branches are commonly hollow.

Sharda (1983) and Thind and Sharda (1985) described their concept of *R. conjunctipes* from the eastern Himalayas. Fruitbody colors were cited as "light salmon to salmon yellow coloured...tips light yellow," and spore dimensions were given as  $7-8.5(-9.5) \times 4-5(-5.5) \mu\text{m}$ . Their concept is probably *R. sino-conjunctipes*, the only discrepant feature being the presence of sclerotoid basidia in the Himalayan specimens, not observed in our collections.

Also to be considered part of this taxonomic complex is *R. petersenii* Thind and Sharda (1985). Fruitbodies are very sparsely branched, and stipe long, single, slender but not fasciculate. Spores are wide ( $7-11.5 \times 5-6.5 \mu\text{m}$ ), and septa clampless. Fruitbody color was given as "orange white to light orange in the central part, stipe pale orange."

Wu (1986) has described *Ramaria hypogaea* (nom. Prov.), fruitbodies of which exhibit fasciculate stipes and stature quite like *R. sino-conjunctipes*. Fruitbody coloration, however, is much brighter than that of *R. sino-conjunctipes*, becoming increasingly orange upward, with orange apices. While not the same as *R. sino-conjunctipes*, *R. hypogaea* surely belongs to the same taxonomic complex.

Specimens examined: Yunnan, Lijiang Pref., White Water, 32 km NE Lijiang, 7. ix. 86, no. 47274 (holotype, TENN; isotype, HKAS, 20064); Lijiang market, 6. ix. 86, no. 47276 (TENN).

In order to facilitate identification of taxa within this complex, the following

(TABLE I) SPORE DATA ON TAXA OF *R. CONJUNCTIPES* COMPLEX

| Name   | Source           | Dimensions                | E         | E <sup>m</sup> | L <sup>m</sup> |
|--|------------------|---------------------------|-----------|----------------|----------------|
| <i>conjunctipes</i>                          | type             | $7.9-9.4 \times 4.7-5.4$  | 1.47-2.00 | 1.80           | 8.19           |
| <i>conjunctipes</i> var. <i>sparsiramosa</i> | M&S <sup>a</sup> | .....                     | .....     | .....          | .....          |
| <i>conjunctipes</i> var. <i>tsugensis</i>    | M&S              | $6-10 \times 4-6.5$       | .....     | .....          | 7.5            |
| <i>fasciculate</i>                           | type             | $7.4-8.5 \times 4.4-5.2$  | 1.26-1.77 | 1.56           | 7.87           |
| <i>ignicolor</i>                             | type             | $7.4-10.0 \times 5.5-5.9$ | 1.31-1.60 | 1.43           | 9.44           |
| <i>lorithamnus</i>                           | type             | $7.9-9.4 \times 4.7-5.8$  | 1.56-1.85 | 1.66           | 8.75           |
| <i>petersenii</i>                            | T&S <sup>b</sup> | $7-11.5 \times 5-6.5$     | .....     | .....          | .....          |
| <i>raveneliana</i>                           | type             | $8.9-11.2 \times 5.0-6.1$ | 1.53-2.00 | 1.80           | 9.94           |
| <i>sino-conjunctipes</i>                     | type             | $7.2-8.3 \times 4.7-5.4$  | 1.31-1.79 | 1.58           | 7.90           |

<sup>a</sup> M&S = Marr and Stuntz (1973).

<sup>b</sup> T&S = Thind and Sharda (1984).

key to worldwide taxa is furnished, as well as data on spore statistics (Table I).

### KEY TO TAXA OF THE *R. CONJUNCTIPES* COMPLEX

1. Stipe single, not fasciculate, up to  $8 \times 0.5$  cm; branches pale orange to pastel orange; apices pale orange; spores  $7-11.5 \times 5-6.5 \mu\text{m}$ ; eastern Hiamalayas..... *R. petersenii*
1. Stipes fasciculate; apices yellow..... 2
2. Fruitbodies entirely ochraceous yellow to mustard yellow; spores  $7.9-9.4 \times 4.7-5.8 \mu\text{m}$  ( $E^m = 1.66$ ;  $L^m = 8.75 \mu\text{m}$ ); Pacific landmasses..... *R. lorithamnus*
2. Fruitbodies with pink, salmon pink or orange branches; apices yellow to orange..... 3
3. Branches and apices orange; fascicles of many individuals; lower 1/3 of fascicle below substrate level..... *R. hypogaea* (nom. prov.)
3. Branches pink, salmon pink or orange; apices yellow..... 4
4. Salmon or pink shades limited to lower 1/3 to 2/3 of branches; upper branches and apices yellow; spores  $7.2-8.3 \times 4.7-5.4 \mu\text{m}$  ( $E = 1.58$ ;  $L^m = 7.90 \mu\text{m}$ ); eastern Himalayas, northern Yunnan..... *R. sino-conjunctipes*
4. Salmon colors covering branches except apices..... 5
5. Spore  $L^m = > 9 \mu\text{m}$ ; branches pink; apices pale, clear yellow..... 6
5. Spore  $L^m = < 8.2 \mu\text{m}$ ..... 7
6. Southern Europe; spore  $E^m = 1.43$ ; spores  $7.4-10 \times 5.5-5.9 \mu\text{m}$ ..... *R. ignicolor*
6. Eastern North America; spore  $E^m = 1.80$ ; spores  $8.9-11.2 \times 5.0-6.1 \mu\text{m}$ ..... *R. raveneliana*
7. Eastern North America..... 8
7. Western North America..... 9
8. Branches yellow-orange; tips pastel yellow; spores  $7.9-9.4 \times 4.7-5.4 \mu\text{m}$  ( $E^m = 1.80$ ;  $L^m = 8.2 \mu\text{m}$ )..... *R. conjunctipes* var. *conjunctipes*
8. Branches pink to pinkish salmon; tips clear yellow; odor sometimes pronounced, sweet; spores  $7.4-5.8 \times 4.4-5.2 \mu\text{m}$  ( $E^m = 1.56$ ;  $L^m = 7.78 \mu\text{m}$ )..... *R. fasciculata*
9. Stipe bases attenuate to a stringy mass; fruitbodies sparsely branched, linear, rarely over 10 cm high..... *R. conjunctipes* var. *sparsiramosa*
9. Stipe bases fasciculate but not stringy; fruitbodies densely branched, up to 18 cm high..... *R. conjunctipes* var. *tsugensis*

### 17. 斑孢丛枝瑚

*Ramaria zebrispora* Petersen. Acta Mycol. Sinica Suppl. 1988. 1: 255.

Fruitbodies (Fig. 1) up to  $10 \times 5$  cm, subcylindrical to slender-obovate in outline. Stipe up to  $11 \times 12$  mm, small, rounded below, off-white, smooth, involving almost no substrate when picked, slowly watery brown where bruised; vinescent spots common, flesh off-white, solid, firm, brittle, slippery or soapy to the touch. Major branches 2—5, up to 8 mm thick, erect, more or less terete; branches in 4—6 ranks, terete, more or less dichotomous, cream-colored or paler when young, buffy cream-colored by maturity; flesh white, firm, not slippery; internode length ratio diminishing gradually at maturity; axils rounded to narrowly rounded; apices slender, erect, minutely digitate to double-dichotomous, lemon yellow, remaining so at maturity. Odor negligible; taste weak, pleasant.

Macrochemical reactions, not recorded.

Tramal hyphae of stipe 3—8  $\mu\text{m}$  diam, hyaline, thin-(usually) to thick-walled (wall up to 1  $\mu\text{m}$  thick), occasionally clamped, tightly packed, interwoven, extensively adherent, inflated clamps up to 12  $\mu\text{m}$  broad, aliform, thick-walled (wall up to 1.5  $\mu\text{m}$  thick), coarsely ornamented; gloeoplerous hyphae not observed. Tramal hyphae of upper branches 4—12  $\mu\text{m}$  diam, hyaline, thick-walled (wall up to 1  $\mu\text{m}$  thick), clamped, more or less parallel, locally adherent, inflated clamps up to 14  $\mu\text{m}$  broad, not unusually thick-walled, unornamented; gloeoplerous hyphae not observed. Subhymenium rudimentary. Hymenium thickening; basidia 45—55  $\times$  7—9  $\mu\text{m}$ , clavate, clamped; contents yellowish, opalescent to minutely multigranular; sterigmata 4, lyriform.

Spores 7.9—9.7  $\times$  4.0—5.0  $\mu\text{m}$  ( $E = 1.92$ — $2.17$ ;  $E^m = 2.03$ ;  $L^m = 8.79 \mu\text{m}$ ), cylindrical to ellipsoid, very obscurely roughened in profile; wall up to 0.2  $\mu\text{m}$  thick; contents yellowish, with obscure, indiscrete ochraceous guttules; hilar appendix moderate; ornamentation of raised, slender, cyanophilous striae oriented longitudinally on the spore wall.

Commentary: The description above is repeated from the original for completeness. A discussion of the species and distinguishing characters may be found in that publication (Petersen, 1988 e).

Fruitbodies of this taxon were collected in the market in Simao by Zang Mu, and so were presumed to be edible.

Specimen examined: Yunnan, Simao market, 20. ix. 83, coll. Zang Mu, no. 45680 (holotype, TENN; isotype, HKAS).

#### 18. Yunnan *Ramaria* taxon 1

Fig. 24

Fruitbodies up to 10  $\times$  7 cm, obovate in outline. Stipe up to 3  $\times$  1.5 cm, single, tapering to rounded base, smooth, without abortive branchlets, off-white, suffused pinkish tan ("cinnamon buff") especially upward, naturally stained orange-brown ("dragon's blood red") in limited areas; flesh solid, off-white, not gelatinous or slippery. Major branches two, terete, stout. Branches in 3—6 ranks, curved-ascending, terete, pallid ochre ("cream buff"); flesh off-white; internodes diminishing upward; axils narrowly rounded throughout. Apices coarse, knobby, pastel yellow ("Naples yellow," "colonial buff"). Odor faintly fabaceous; taste negligible.

Macrochemical reactions: SYR = weakly weakly positive on rind only; FCL = positive; CRE, IKI, ANO, ANW, PHN, PYR, GUA = negative.

Tramal hyphae of upper branches hyaline, clampless, not agglutinated or adherent, parallel, in two tissues: 1) medullary, 4—14  $\mu\text{m}$  diam, thick-walled (wall up to 1  $\mu\text{m}$  thick); and 2) cortical, 2—6  $\mu\text{m}$  diam, thin-walled; ampulliform septa up to 17  $\mu\text{m}$  broad, thick-walled (wall up to 2  $\mu\text{m}$  thick), unornamented; gloeoplerous hyphae not observed. Subhymenium extensive; hyphae

1.5—2.5  $\mu\text{m}$  diam, tightly interwoven, clampless. Hymenium thickening; basidia 60—70  $\times$  8—9  $\mu\text{m}$ , clavate, clampless; contents homogeneous to granular, hardly cyanophilous; sterigmata 4, stout, sterigmata straight.

Spores 7.6—10.1  $\times$  3.6—5.0  $\mu\text{m}$  ( $E=1.71-2.36$ ;  $E^m=2.00$ ;  $L^m=8.87\mu\text{m}$ ), ellipsoid to narrowly ovate, flattened adaxially, roughened in profile; contents sludgy or with 1—3 dark, ill-defined inclusions; wall up to 0.2  $\mu\text{m}$  thick; hilar appendix not prominent; ornamentation of small, scattered warts and delicate, short, anastomosing ridges.

Commentary: The naturally occurring stains on the stipe would usually be a diagnostic character, but in this case the color is not ruby red or maroon, but an orange brown, possibly caused by pre-harvest damage or decay (although no microscopic evidence of this could be seen). Because of this, We cannot give the sole specimen a nomenclatural rank. We describe it here only to bring attention to it by future collectors.

Specimen examined: Yunnan, Lijiang Pref., Lijiang market, 30. viii. 86, no. 47308 (TENN, HKAS: 20045).

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## 滇产丛枝瑚属之丛枝瑚亚属 和艳丛枝瑚亚属

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**摘要** 本文讨论了丛枝瑚菌属中的丛枝瑚亚属, 其中云南产的一新种: 洱源丛枝瑚 *Ramaria eryuanensis*; 在滇西北高山林带蕴育着极为丰富的艳丛枝瑚亚属的种类, 在现知该亚属的18种中, 本区计有如下的13种新种: 即棕顶丛枝瑚 *Ramaria brunneipes*、离生丛枝瑚 *Ramaria distinctissima*、桔皮丛枝瑚 *Ramaria ephemeroderma*、脐孢丛枝瑚 *Ramaria hilaris*、光孢丛枝瑚 *Ramaria laeviformosoides*、拟细丛枝瑚 *Ramaria linearioides*、细丛枝瑚 *Ramaria linearis*、短孢丛枝瑚 *Ramaria nanispora*、朱细丛枝瑚 *Ramaria rubri-attenuipes*、华联丛枝瑚 *Ramaria sino-conjunctipes*、红肉丛枝瑚亮色变种 *Ramaria rubricarnata* var. *laeta*、红顶丛枝瑚微孢变种 *Ramaria botrytoides* var. *microspora*、新美丛枝瑚中华变种 *Ramaria neoformosa* var. *sinensis*。在亚属等级下并附有分种检索表, 对鉴定用的化学指示液的配制亦作了说明。对孢子大小的测定标准, 其中 E 指所测的20枚孢子中, 孢径的平均值; L<sup>m</sup>示孢子最大的长径; E<sup>m</sup>示孢子最大的阔径。

**关键词** 丛枝瑚亚属; 艳丛枝瑚亚属; 云南